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THE APPLE MAGGOT

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Bureau of Plant Industry



Apple maggot injury.

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## SUMMARY

The apple maggot commonly called the "railroad worm" is one of the principal insect enemies of the apple and is found throughout Pennsylvania.

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The maggot can be detected by its dark-colored burrows or tunnels through the pulp of the infested apple. The fruit ripens prematurely and drops.

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Neglected orchards are more liable to heavy infestation than orchards which are thoroughly sprayed.

The apple maggot can be controlled. Important control measures are:

1. Pick up and destroy all fallen fruit.
2. Cut down wild or volunteer apple trees which can not be properly cared for.
3. Follow the poison spray schedule as recommended in this circular.

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# THE APPLE MAGGOT OR "RAILROAD WORM"

By T. L. Guyton and J. N. Knull.\*

Numerous reports of injury to apples in Perry County, Pa., persisting over a period of several years, led to an investigation of the trouble. As a result of this investigation, it was readily determined that the trouble was due to the activities of the apple maggot, one of the insect pests affecting apples, which is more or less general throughout the state, and which at times becomes abundant enough to result in serious damage to the apple crop.

## ECONOMIC IMPORTANCE.

The apple maggot (*Rhagoletis pomonella* Walsh) is found generally throughout Pennsylvania, wherever its chief host plant, the apple, is found, and it is one of the principal enemies of the apple in the state. It is often known as the "railroad worm" due to the

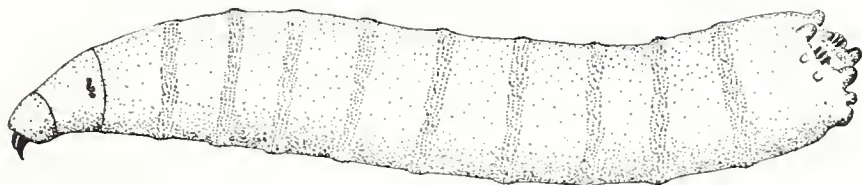


Plate I. Larva of apple maggot, enlarged about  $\times 16$ .

habit of the larva or maggot making irregular dark-colored burrows or tunnels through the pulp of the infested apple. (See cover page and Plate III). Isolated or wild apple trees which receive little or no attention are quite generally infested and furnish a source from which infestation readily spreads to orchards which receive better care. Very often orchards which are not properly cared for either by reason of the failure of the owner to apply the regular spray schedule, or through lack of thoroughness of application, suffer severe injury.

## NATURE OF INJURY.

Fruit attacked by the apple maggot is made practically worthless by the irregular burrows of the larvae. Infested apples ripen prematurely and fall to the ground. This is followed shortly by a decaying of the fruit. Sweet apples and early ripening varieties are most susceptible to attack.

Our observations indicate that the aroma and mellowness of the fruit are quite instrumental in attracting the female flies for egg laying. Dimples appear at the points on the fruit where the eggs are laid. At the bottom of each one of these depressions is a tiny hole, marking the place where the egg was inserted.

\*Photographs by H. B. Kirk. Drawings by J. N. Knull.

## FOOD PLANTS.

In addition to apples, this insect has been recorded as infesting crab apples, plums, hawthorn (*Crataegus*), wild haw and sometimes pears, huckleberries, blueberries and cherries.

## LIFE HISTORY.

In connection with the investigation of the life history of this insect, two heavily infested orchards, representing average conditions, were selected for observation. Numerous cages of infested apples were arranged in the field at various points, in order to secure emergence and life history records under natural conditions. Spraying experiments were carried on, and the value of clean culture in the management of the orchard was tested with very satisfactory results.

The insect spends the winter in an inactive or resting stage within a small case known as the puparium. This puparium is a small, brown, oval case, about three sixteenth of an inch in length and one-sixteenth of an inch in diameter, and is commonly found just below the surface of the ground.

The adult flies, which are the parents of the maggot, emerge from these puparia usually during the latter part of June. In emerging from the ground the flies work their way to the surface, where their wings soon dry, after which they are ready to fly.

The adult fly is slightly smaller than the house fly, dark-colored, head and legs brown, and with three to four white strips across the

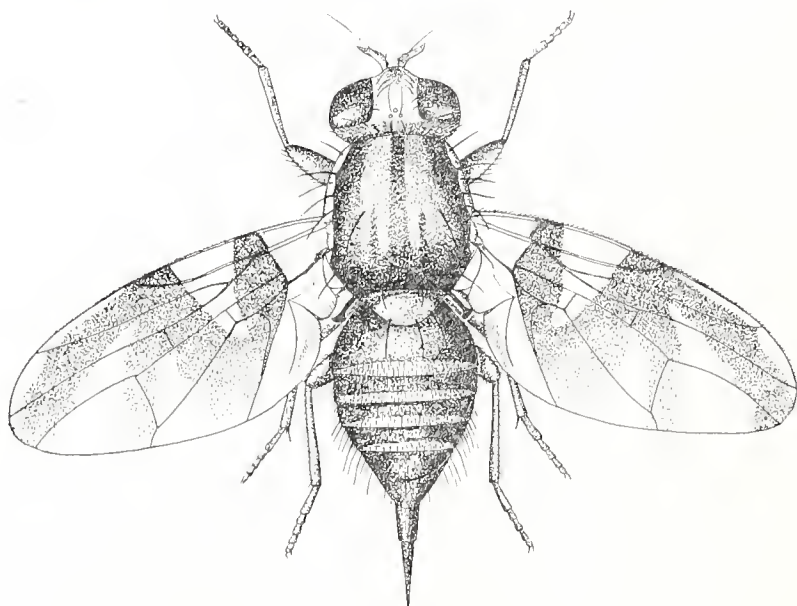


Plate II. Female apple maggot, enlarged about  $\times 9$ .

abdomen. The wings are marked each with four dark bands. (See Plate II)

The adults probably do not fly long distances, for they are rather sluggish in their movements and it is often possible to handle an apple containing an adult without disturbing it. When forced to fly the adults will often travel very short distances sometimes only a few inches.

In 1921, near Ellittsburg, Perry County, Pa., the first adults were observed in the field on June 27. On July 2 adults were found laying eggs on Wealthy apples.

The eggs are cream colored, roughened at one end and are inserted in the pulp of the apple just beneath the skin. They hatch in about five days and the young larvae start to burrow in irregular courses through the flesh of the fruit. The larvae are small, pale, legless creatures with the body segments rather inconspicuously marked

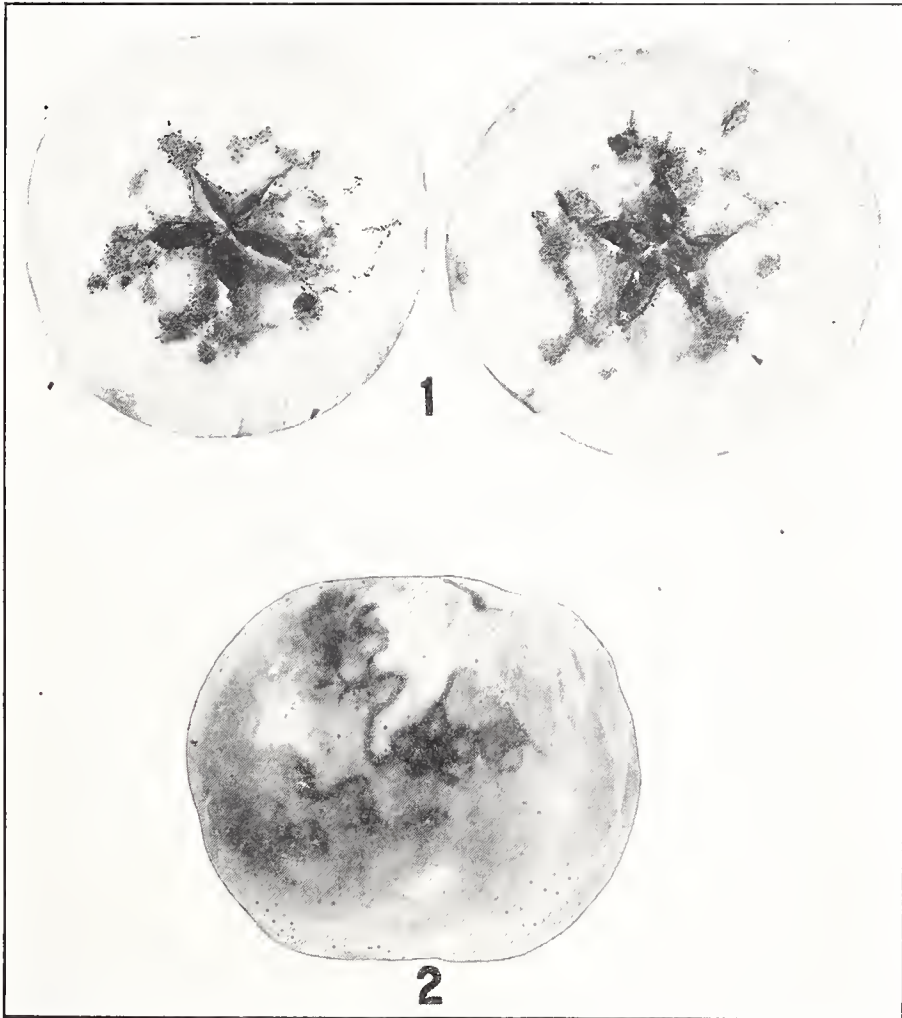


Plate III Apples showing damage caused by the apple maggot.

(See Plate I) They are found in the apples for varying lengths of time, and in a season favorable to the insect will cause heavy damage to the fruit.

After reaching maturity the larvae make holes to the exterior of the infested fruit, leave the fruit which normally has fallen to the ground by this time, and go into the ground to transform. After entering the ground, the outer skin of the larvae harden and form the little cases called purparia.



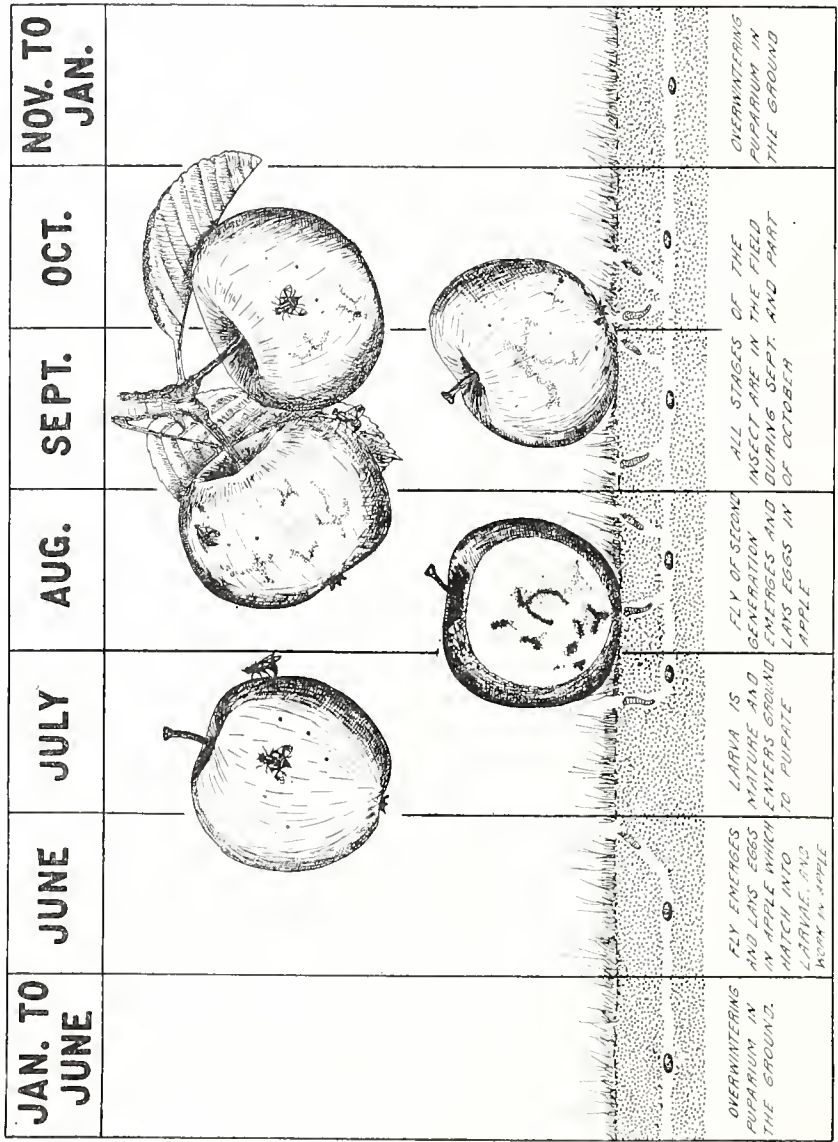


Plate IV. Diagram showing life history of the apple maggot.

In the vicinity of Ellittsburg the larvae of the overwintering or first generation began entering the ground on July 21st. On August 31st the first adults of the second generation emerged from caged Wealthy and Smokhouse apples, and they continued to emerge up to October 12th. These adults of the second generation lay eggs in other fruit and the life cycle is again started.

The adult flies live a considerable length of time, having remained alive thirty-eight days in captivity in our experiments; they have been recorded by other workers as living even longer.

Due to the length of life of the adult flies, there is a great overlapping of generations, and adult flies are present in the orchard from the latter part of June until frost comes in the fall. As a result, all stages of larvae can be found in the infested fruit. Those larvae entering the ground late in the season remain as puparia over the winter, while many smaller larvae in the fruit are killed by the winter. The species has been recorded as remaining in the dormant state for over a year. Plate IV is a diagram of the life history as it occurs in Perry County. As noted above, there are many exceptions to this life history sketch.

## RECOMMENDED METHODS OF CONTROL.

The following methods for control have been tested and found to be quite satisfactory, and they are therefore recommended for practice under Pennsylvania conditions.

1. *Pick up and destroy fallen fruit.* This may be done either by hand and feeding to stock, or by turning stock loose under the infested trees. The use of hogs, cattle or sheep for this purpose is quite satisfactory, but they may sometimes do injury to the trees. Also drops may be picked up, placed in tight barrels or boxes, and after drying be burned.

2. *Cut down wild or volunteer apple trees which can not be properly cared for.* These wild trees, if not properly cared for, will prove a never-ending source of infestation, as well as providing likewise a source of infection for various diseases, and are in general a menace to the individual grower and to the community as a whole.

3. *Follow the generally recommended spray schedule given below faithfully and thoroughly.* The fact that the adult fly in feeding extends its proboscis and touches the surface of the fruit, makes it possible to get quite satisfactory results with the use of the ordinary stomach poison sprays.

The complete spray schedule most satisfactory for apples is as follows:

(a) Dormant, or delayed dormant spray. (Lime sulphur 1 gallon to 8 gallons of water; and if delayed dormant is applied where aphids are present, nicotine sulphate containing forty per cent nicotine should be added to this spray at the rate of  $\frac{3}{4}$  pint to 100 gallons spray solution).

(b) Pink spray. (Lime sulphur  $1\frac{1}{4}$  gallons to 50 gallons of water powdered arsenate of lead  $1\frac{1}{2}$  pounds to 50 gallons of spray solution)

(c) Petal-fall spray (First codling moth spray).

(Lime sulphur  $1\frac{1}{4}$  to 50 gallons of water, powdered arsenate of lead  $1\frac{1}{2}$  pounds to 50 gallons of spray. If troubled with redbug, nicotine sulphate containing forty per cent nicotine should be added at the rate of  $\frac{3}{4}$  pint to 100 gallons spray solution).

(d) Two weeks after petal fall (Second codling moth spray).

(Lime sulphur  $1\frac{1}{4}$  to 50 gallons of water, powdered arsenate of lead  $1\frac{1}{2}$  pounds to 50 gallons of spray solution).

(e) Ten weeks after petal fall spray. (Third codling moth spray).

(Lime sulphur  $1\frac{1}{4}$  to 50 gallons of water, powdered arsenate of lead  $1\frac{1}{2}$  pounds to 50 gallons of spray solution). The lime sulphur should test  $32^{\circ}$  to  $33^{\circ}$  Baume. The arsenate of lead paste is just one-half as strong as the powder, and in case the paste form is used the amount should be doubled.

*Sprays (d) and (e) are the important sprays in the control of the apple maggot.* All others should be made also, if perfect fruit is to be expected.

All spray applications must be thorough, and made at the exact time indicated in the schedule. In our experimental work very good success was secured in heavily infested orchards by following these recommendations. In commercial apple growing sections where definite spray schedules are followed, damage by this pest is very unusual.